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AN 2000:412389 HCAPLUS
DN 133:33391
TI Extremely thin copper alloy **wire** having high strength and its manufacture
IN Ichikawa, Masamitsu; Sawamoto, Takehito; Sugiyama, Shuichi
PA Fujikura Ltd., Japan
SO Jpn. Kokai Tokkyo Koho, 4 pp.
CODEN: JKXXAF
DT Patent
LA Japanese
FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2000169918	A2	20000620	JP 1998-346223	19981204

AB The extremely thin Cu alloy **wire** contains 0.05-2.0% Ag and has tensile strength .gtoreq.35 kg/mm2. A Cu-(0.05-2.0%)Ag alloy **wire** material is drawn at .gtoreq.50% draft and coated with an insulating material under heating at 200-400.degree..

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-169918

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(71)Applicant : FUJIKURA LTD

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SAWAMOTO TAKEHITO
SUGIYAMA SHUICHI

(54) EXTRA-THIN WIRE AND ITS PRODUCTION

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a method for producing an extra-thin wire having high strength of ≥ 35 kgf/mm2 tensiles strength and used as a magnet wire or the like.

SOLUTION: A copper alloy wire rod in which the concn. of Ag is controlled to 0.05 to 2.0 wt.%, and the balance copper with inevitable impurities is subjected to wire drawing at a wire drawing ratio of ≥50%, and, after that, this wire-drawn copper alloy wire rod is coated with an insulating material under heating at 200 to 400°C, which is baked. By this Ag concn. and heating temp. at the time of the coating and baking, an extra-thin wire having high strength of ≥35 kgf/mm2 tensile strength and used as a magnet wire or the like can be obtd.

LEGAL STATUS

[Date of request for examination]

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[Patent number]

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decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The extra fine wire which makes Ag concentration 0.05 - 2.0wt%, and is characterized by the bird clapper from the copper alloy wire rod whose remainder is Cu.
[Claim 2] The manufacture method of the extra fine wire which Ag concentration is made into 0.05 - 2.0wt%, and the rate of wire drawing performs 50% or more of wire drawing to the copper alloy wire rod whose remainder is Cu, and applies an insulating material under 200-400-degree C heating at this copper alloy wire rod by which the wire drawing was carried out, and is characterized by printing after an appropriate time.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the extra fine wire used as magnet wires, such as electronic equipment, etc., and its manufacture method.
[0002]
[Description of the Prior Art] Narrow diameter-ization is increasingly demanded also for the magnet wire (coil) used for this with the miniaturization of electronic equipment, and lightweight-izing in recent years. However, the fracture tension of a wire rod becomes small, so that the cross section of a wire rod becomes small. For this reason, if the extra fine wire used as a magnet wire, especially a diameter (phi) are in a thing 0.1mm or less, it is required that it should have high tensile strength.
[0003] Usually, as a narrow diameter magnet wire, after carrying out wire drawing of the copper wire to predetermined size, the synthetic enameled wire which made various insulating materials apply, bake and cover with an elevated temperature is used.
[0004] on the other hand, the same of copper wire is said of a metal wire besides (--) and by carrying out wire drawing, work hardening is carried out and it comes to have high tensile strength In using copper wire as conductors, such as an electric wire, it is making it obtain required tensile strength in many cases using the property by this wire drawing.
[0005]
[Problem(s) to be Solved by the Invention] However, also under the temperature between about 200-300 degrees C, a metal texture recrystallizes and the copper wire by which work hardening was carried out has the property to soften.
[0006] for this reason -- above -- as a magnet wire -- copper wire -- using -- up to predetermined size -- wire drawing -- also carrying out -- when an insulating material was applied and printed at an elevated temperature and it considered as a synthetic enameled wire etc. after that, usually, application of an insulating material and baking needed to be performed at the elevated temperature of 200 degrees C or more, copper wire became soft by high temperature processing at the time of this insulating material application, and there was a problem that tensile strength will fall
[0007] that by which this invention was made in view of such a conventional trouble -- it is -- alloy composition of a wire rod, and the various examination about the manufacture method -- carrying out -- a conductor -- the tensile strength of the section -- 35kgf/mm2 the extra fine wire and its manufacture methods for [which has the above high intensity] magnet wires -- it is going to provide -- it is a thing
[0008]
[Means for Solving the Problem] this invention according to claim 1 makes Ag concentration 0.05 - 2.0wt%, and is in the extra fine wire which the remainder becomes from the copper alloy wire rod which is Cu.
[0009] Ag concentration is made into 0.05 - 2.0wt%, the rate of wire drawing performs 50% or more of wire drawing to the copper alloy wire rod whose remainder is Cu, and this invention according to claim 2 is in the manufacture method of the extra fine wire which applies and prints an insulating material on this copper alloy wire rod by which the wire drawing was carried out under 200-400-degree C heating after an appropriate time.
[0010]
[Embodiments of the Invention] In the extra fine wire of this invention, in order to prevent softening of the wire rod at the time of high temperature processing at the time of applying and printing an insulating material under the elevated temperature of 200 degrees C or more, Ag is added in copper (Cu), it considers as a copper alloy wire rod, and the Ag concentration is made into 0.05 - 2.0wt%. In addition, in this copper alloy wire rod, the impurities (for example, Si, P, Fe, etc.) of the minute amount which cannot usually be removed in process besides Ag are contained as an unescapable impurity.
[0011] Here, less than [0.05wt%], it is 2 to have made Ag concentration into 0.05 - 2.0wt% 35 kgf/mm, although

thermal resistance improves and tensile strength is improved by addition of Ag. It is because the above high tensile strength was not obtained, and is because the problem of being easy to disconnect in case wire drawing nature gets worse and a wire drawing is carried out to an extra fine wire will come to arise if 2.0wt(s)% is exceeded.
[0012] Furthermore, in case insulating materials, such as a synthetic enamel, are applied and printed using the copper alloy wire rod of such Ag concentration and extra fine wires, such as a magnet wire, are manufactured, the rate of wire drawing performs 50% or more of wire drawing to this copper alloy wire rod.
[0013] This wire drawing is performed between the so-called colds about ordinary temperature (25 degrees C) using a cooling means as occasion demands, and it is made for the rate of wire drawing to become 50% or more moreover. Here, 50% or more says the thing of the working ratio by which the reduction of area of the wire rod end-face product in front of a wire drawing is made 50% or less by the elongation after a wire drawing in the rate of wire drawing. At less than 50%, having made this rate of wire drawing into 50% or more has the small improvement in the tensile strength by work hardening, and since it is inadequate, by making this value into 50% or more, it is the stage of wire drawing and aims at improvement in predetermined tensile strength first.
[0014] Next, insulating materials, such as a synthetic enamel, are applied and printed on this copper alloy wire rod by which the wire drawing was carried out under 200-400-degree C heating. the conductor made into the purpose by this -- the tensile strength of the section -- 35kgf/mm2 The extra fine wire which has the above high intensity is obtained. here -- a conductor -- the tensile strength of the section means the tensile strength of the copper alloy wire rod portion in the state where parts for a pre-insulation layer, such as a synthetic enamel, were exfoliated
[0015] Heating temperature was made into the range of 200-400 degrees C at this application and the baking process because heating temperature of temperature was too low at less than 200 degrees C and it was hard coming to secure a uniform application on the wire rod front face of an insulating material. Moreover, conversely, exceeding 400 degrees C, when temperature is too high, the copper alloy wire rod itself becomes soft, tensile strength falls, and it is 2 35 kgf/mm. It is because the above high tensile strength is no longer obtained.
[0016] As shown in example point ** and Tables 1-2, two or more skimming copper alloy wire rods (examples 1-5, examples 1-5 of comparison) with a diameter of 8mm with which Ag concentration differs, respectively were manufactured with continuous casting equipment, and, finally the wire drawing was carried out to the diameter of 0.02mm. In the intermediate wire-size stage, intermediate annealing of multiple times was performed at the temperature of 300-400 degrees C in the meantime.
[0017] And according to the rate of wire drawing as shown in Tables 1-2, the last wire drawing (wire drawing from the diameter of 0.05mm to the diameter of 0.02mm) was performed after the last intermediate annealing, next the insulating material of synthetic enamels (varnish etc.) was applied and baked under heating temperature as is run each above-mentioned copper alloy wire rod by linear velocity 150 m/min and shows it in Tables 1-2, and each extra fine wire was obtained.
[0018] each of these extra fine wires -- a conductor -- the tensile strength and wire drawing nature of the section were measured, and the result was written together to Tables 1-2 Here, tensile strength set to the tension tester the copper alloy wire rod portion in the state where a part for a pre-insulation layer was exfoliated, and performed it. About wire drawing nature, the wire drawing from the diameter of 0.05mm to the diameter of 0.02mm was performed by the continuation strip wire drawing machine, the number of times of an open circuit per 10kg in that case considered 10 or less times of things as success (O), and the thing exceeding 10 times was evaluated as rejection (x).
[0019]
[Table 1]

	実施例				
No.	1	2	3	4	5
Ag濃度 (wt%)	0.56	0.075	1.8	0.075	0.075
伸線加工率 (%)	99	99	99	99	56
塗布、焼付け温度 (℃)	250	250	250	380	380
引張強度 (Kgf/mm^2)	58	49	62	38	36
伸線性	○	○	○	○	○

[0020]
[Table 2]

	比較例				
No.	1	2	3	4	5
Ag濃度 (wt%)	0.03	2.2	0.56	0.56	0.0008
伸線加工率 (%)	99	99	99	47	99
塗布、焼付け温度 (℃)	250	250	450	250	250
引張強度 (Kgf/mm^2)	29	64	33	33	27
伸線性	○	×	○	○	○

[0021] the case of the extra fine wire (examples 1-5) which starts this invention from the above-mentioned table 1 -- any -- a conductor -- the tensile strength of the section -- 35kgf/mm2 while high intensity is obtained above -- wire drawing nature -- any -- although -- it was success (O)
[0022] on the other hand -- the case of the example 1 of comparison which is too lower than the conditions of this invention -- the conductor after printing -- the tensile strength of the section -- 29kgf/mm2 It was low. the case of the example 2 of comparison which is too higher than the conditions of this invention -- the conductor after printing -- the tensile strength of the section -- 64kgf/mm2 although it is high -- wire drawing nature -- a rejection -- it was (x) the case of the example 3 of comparison which is too higher than the conditions of this invention -- the conductor after printing -- the tensile strength of the section -- 33kgf/mm2 It was low. the case of the example 4 of comparison which is too smaller than the conditions of this invention -- the conductor after printing -- the tensile strength of the section -- 33kgf/mm2 It was low. Ag concentration (0.0008wt%) is low -- elapsing -- the case of the example 5 of comparison almost near a pure copper -- the conductor after printing -- the tensile strength of the section -- 27kgf/mm2 It was low.
[0023]
[Effect of the Invention] according to the extra fine wire which starts this invention so that clearly from the above explanation, and its manufacture method -- a diameter -- the thing 0.1mm or less which consists of a narrow copper alloy wire rod extremely -- it is -- and a conductor -- the tensile strength of the section -- 35kgf/mm2 The outstanding wire rod which has the above high tensile strength is obtained. If this is used as a magnet wire etc., the miniaturization of electronic equipment and lightweight-ization can be promoted sharply.

[Translation done.]

TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the extra fine wire used as magnet wires, such as electronic equipment, etc., and its manufacture method.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Narrow diameter-ization is increasingly demanded also for the magnet wire (coil) used for this with the miniaturization of electronic equipment, and lightweight-izing in recent years. However, the fracture tension of a wire rod becomes small, so that the cross section of a wire rod becomes small. For this reason, if the extra fine wire used as a magnet wire, especially a diameter (phi) are in a thing 0.1mm or less, it is required that it should have high tensile strength.

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[Translation done.]

EFFECT OF THE INVENTION

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[Translation done.]

TECHNICAL PROBLEM

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---

[Translation done.]

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[0019]

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	実施例				
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伸線加工率 (%)	99	99	99	99	56
塗布、焼付け温度 (℃)	250	250	250	380	380
引張強度 (Kgf/mm^2)	58	49	62	38	36
伸線性	○	○	○	○	○

[0020]

[Table 2]

	比較例				
No.	1	2	3	4	5
Ag濃度 (wt%)	0.03	2.2	0.56	0.56	0.0008
伸線加工率 (%)	99	99	99	47	99
塗布、焼付け温度 (℃)	250	250	450	250	250
引張強度 (Kgf/mm^2)	29	64	33	33	27
伸線性	○	×	○	○	○

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almost near a pure copper -- the conductor after printing -- the tensile strength of the section -- 27kgf/mm2 It was low.

[Translation done.]